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Geographical Distribution of the Melastomataceae in Eastern Asia

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With two text-figures

I. Introduction

The Malastomataceae are primarily tropical and subtropical plants. The family is more highly developed in the tropics of the western hemisphere than is in the tropics of the east; about two-third of the approximately three thousand species are found in America. No one genus is common to both regions; as a matter of fact, all tribes between the Old and the New World, with the exception of the Memecyleae, are distinct, a fact indicating the long separation of the members of the family in the tropics of the world.

Although the family is mainly of the tropics, a number of the genera contain species that inhabit also subtropical and warmer parts of the temperate regions. Some of the genera are native and almost confined to these less torrid zones. As in plant geography, on the Asiatic mainland, especially in subtropical and temperate eastern Asia, no sharp latitudinal division line of floristic zones has been recognized, it will be of interest to study the distribution of some of the primarily tropical families like the Melastomataceae and to determine the limit of extension of their various genera and species. The Melastomaceae are illustrative especially with regard to the northern advent of the tropical Indo-Malayan elements toward the Asiatic mainland.

There is no up-to-date and complete revision of the family for the whole area concerned, but the various existing treatments of the family pertaining to this area (2, 3, 6, 7), give us a fairly complete knowledge of the taxonomy of the family in eastern Asia. All together seventeen genera occur in our area. According to their geographical ranges, these genera may be grouped as follows.

II. Distribution of Genera

Group I. Genera confined to the tropics. To this group belong such genera as *Astronia*, *Anplectrum*, and *Pternandra*. *Astronia*, with over 20 species,

is a genus of the islands of the Pacific and the Malay Archipelago. One of the species, *A. Cumingiana* Vidal, distributed from the Celebes to the Philippines, has its northern range extending to the southernmost part of Formosa. It occurs in moist shady places in the broad-leaved primary forests of Kosyun Peninsula and Botel Tobago and Kasyoto islands. These islands, although close to Formosa, contain many Philippine elements that are otherwise not found in Formosa.

Anplectrum, with about 20 species, is a genus of India and Malaysia. *Anplectrum glaucum* (Jack) Triana of Malay, India, and Indo-China, is the only species that extends to Hainan Island in China.

Pternadra, with about 6 species, is distributed throughout tropical Asia from India through Malaysia to Indo-China. *P. caerulescens* Jack, a species that has almost the entire range of the genus, occurs also in Hainan.

Genera of this group thus do not extend to the continental part of China, but with occassional species invading the more tropical parts of the islands of Hainan and Formosa.

Group II. Genera primarily of the tropics but with species inhabiting subtropical areas. To this group belong a large number of genera; they are *Melastoma*, *Osbeckia*, *Allomorphia*, *Oxyspora*, *Sonerila*, *Medinilla*, and *Memecylon*.

The range of *Melastoma*, a genus of over 40 species, extends from Oceania, northern Australia to tropical and subtropical eastern Asia. No less than 9 species are found in our area. Some of the species, like *M. polyanthum* Blume, *M. normale* D. Don, and *M. sanguinem* Sims, are very wide-spread in the Asiatic tropics and are also common in the warmer parts of China. They usually occur in thickets and waste lands at low altitudes. *M. dodecandrum* Lour. and *M. candidum* D. Don are common plants of the warmer parts of China and Indo-China, the latter being also found in Formosa. *M. penicillatum* Naud. is found in the Philippines as well as in Hainan Island. Besides these species, a number of the other species are more limited in their ranges and are native only to the more northern latitudes, such as *M. intermedium* Dunn of Fukien, *M. suffruticosum* Merr. of Kwangsi and Hainan, and *M. Kudoi* Sasaki of Formosa. The presence of these endemics clearly shows that the genus as a whole, besides in the tropics, is also well established in the subtropical regions of eastern Asia.

Osbeckia has a more or less similar situation. The genus comprises about 50 species in the tropics of the Old World. About 5 species are found in China. Among these are some of the very common tropical plants that are

also widely distributed in the warmer parts of China; they are *O. chinensis* L. and *O. crinita* Benth. The former is also present in Formosa, the Liukiu Islands, and southern Japan. Both species are common in thickets and waste lands from low to high altitudes. *O. stellata* Wall., found in India and Siam, occurs also in Yunnan. Only *O. melastomoides* Merr. & Chun of Hainan is endemic to our area. However, it is an anomalous species that may hot even pertain to this genus.

The genus *Otanthera*, a primarily tropical genus intermediate in characters between *Melastoma* and *Osbeckia*, is represented by one species, *O. scaberrima* (Hay.) Ohwi, in our area. It is a very common plant of the thickets and secondary forests at high altitudes throughout the whole island of Formosa.

In the genus *Allomorphia*, there are about 20 species distributed from the Oceanic islands through Malaysia to southern China. The species as found in eastern Asia are mostly limited in their ranges. Among them, *A. Balansae* Cogn. has the widest range, being found in Indo-China, southeastern Kwangsi and adjacent mountain ranges of Kwangtung, and Hainan Island. Floristicaly these areas comprise a uniform region. *A. urophylla* Diels and *A. caudata* (Diels) Li are both endemic to southern Yunnan, *A. setosa* Craib to northern Siam and southern Yunnan, and *A. flexousa* Hand.-Maz. to Kwangsi.

Oxyspora is a small genus of less than 10 species, mostly found in the East Indies. Three species are found in China, namely, *O. paniculata* DC., a common plant of India, Indo-China, and southwestern China (Yunnan, Kweichow, and Kwangsi) at lower altitudes and *O. yunnanensis* Li and *O. glabra* Li, both localized in northwestern Yunnan on mountain slopes at altitudes of about 1600–2800 meters.

Phyllagathis has a wide range of distribution throughout Malaysia and southeastern Asia. Because of the current indefinite limitation of the generic concept, the exact number of species is uncertain. The number is probably around 20–30. The species are mostly of narrow ranges. Two or three species occur in Indo-China. No less than 7 species are known from China. *P. Cavaleriei* (H. Lév. & Van.) Guillaum. has the widest range extending from Kweichow through Kwangsi, southern Kiangsi, Kwangtung to southern Fukien. Other species are localized to Yunnan (*P. ovalifolia* Li), Sikang and Szechuan (*P. longipes* Li), Hunnan (*P. anisophylla* Diels), Kwangtung (*P. oligotricha* Merr.), and Tonkin, Indo-China (*P. setotheca* Li). The genus as a whole is therefore represented mostly in southern China more especially toward the southeast. However, several of the species are only doubtfully referred to this genus and

further taxonomic studies may prove that it will be desirable to have different generic dispositions.

Sonerila is a large genus of over 70 species in India, the Malay Archipelago, and southern China. About 10 species are recorded from China, the species being confined only to the southernmost subtropical parts. Indo-Malayan species that extend to Yunnan or Kwangsi and Kwangtung are: *S. rivularis* Cogn., *S. picta* Korth., *S. epiloboides* Stapf & King, and *S. tenera* Royle. Endemic species are: *S. contonensis* Stapf (Hainan, Kwangtung, Fukien), *S. yunnanensis* J. Jeffry (southern Yunnan), *S. plagiocardia* Diels (western Yunnan), *S. hainanensis* Merr. (Hainan), *S. cheliensis* Li (southern Yunnan), and *S. laeta* Stapf (western China). In China, the species of this genus generally occur at low to medium-high altitudes of about 1000-1500 meters.

Pachycentria, with about 15 species, is a Malaysian genus, especially well developed in Borneo. *P. formosana* Hay., the only species known to our area, is found in Formosa. It is a small epiphytic shrub occurring in dense rain forests at medium and high altitudes throughout the whole island.

Medinilla is a very large genus with over 100 species extending from western Africa through India to the Malay Archipelago. At least 9 species are definitely known from China and there are apparently additional species to be discovered. In China, the species are found only in Yunnan and Hainan, mostly at medium to high altitudes. *M. erythrophylla* Lindl., a species of the eastern Himalayan region, eastern Bengal, and Upper Burma, is now also known from western Yunnan. *M. spetentrionalis* (W. W. Smith) Li, a species originally known from Indo-China and Upper Burma, is also recorded from southern Yunnan and adjacent western Kwangsi. *M. Spirei* Guillaum., originally known from Indo-China, is also recorded from Yunnan, Kwangsi, and Hainan. *M. himalayana* Hook. f. of the Himalayan region, is also found in southern Yunnan. *M. radicans* Blume, a species extending from Java to Indo-China, is also found in Hainan. *M. Tsaii* Li and *M. yunnanensis* Li are known from Yunnan only. *M. formosana* Hay. and *M. Kawakamii* Hay. are endemic to Formosa.

Memecylon is another large genus with over 100 species widely distributed from the Pacific islands, Australia, through tropical Asia to Africa. The genus is well represented in China with about 8 species. They are confined to Hainan, the southern part of Kwangsi, Kwangtung, and Yunnan. They include such common species of the Asiatic tropics as *M. parviflorum* Blume, *M. scutellatum* (Lour.) Naud., and *M. floribundum* Blume. More limited in their ranges are *M. nigrescens* Hook. & Arn. (Kwangtung, Hainan), and *M. ligustrifolium* Champ.

(Yunnan, Kwangsi, Kwangtung, Hainan). *M. octocostatum* Merr. & Chun and *M. hainanense* Merr. & Chun are found only in Hainan, while *M. polyanthum* Li is found only in southern Yunnan.

Group III. Genera mainly of subtropical Asia or with ocassional species extending southward to the tropics. To this group belong such genera as *Plagiopetalum, Cypotheca, Barthea, Sarcopyramis, Fordiophyton, Stapfiophyton,* and *Scorpiothyrsus.*

Plagiopetalum is a small genus of two species only, one of them, *P. Esquirolii* (H. Lév.) Rehder is widely distributed in Szechuan, Kweichow, Yunnan, and Kwangsi, while the other, *P. hainanense* (Merr. & Chun) Merr. is endemic to Hainan. *Cypotheca* is a monotypic genus, the species, *C. montana* Diels, being confined to southern Yunnan. *Barthea* is only of two species, *B. Barthei* (Hance) Krasser of Kwangsi and Kwangtung and *B. formosana* Hay. of Formosa. The species of these three genera are usually present in forests at high altitudes.

Blastus is a genus of about 15 species mostly of the warmer parts of China. *B. Cogniauxii* Stapf is the only tropical species, being found as far south as Borneo and as far north as Hainan and Kweichow. *B. cochinchinensis* Lour. has a fairly wide range extending from India, Indo-China to southern China (Kwangsi, Kwangtung, Hainan, and Formosa) and the Liukiu Islands. These plants are found in forests at medium to high altitudes. The other species of the genus are all of limited ranges and of fairly high altitudes from about 1300 to 2800 meters. The distribution of these species is as follows:

B. tenuifolius Diels (Kwangsi).
B. setulosus Diels (Kwangsi).
B. latifolius Li (southern Yunnan).
B. Tsaii Li (Yunnan).
B. mollissimus Li (Kwangei).
B. hirsutus Li (Yunnan).
B. Dunnianus H. Lév. (Kweichow, Kwangsi, Kwangtung).
B. Cavaleriei H. Lév. & Van. (Kweichow, Kwangsi).
B. tomentosus Li (Kwangsi).
B. Ernae Hand.-Maz. (Kwangtung).
B. longiflorus Hand.-Maz. (southern Kiangsi, Kwangtung, Kwangsi).
B. apricus (Hand.-Maz.) Li (Kwangtung),
B. pauciflorus (Benth.) Guillaum. (suthern Kiangsi, Kwangtung).

Bredia (including *Tashiroea*), with about 20 species, is a genus primarily

of the warmer parts of eastern Asia. The genus falls into three natural sections each occupying a more or less definite region. (Fig. 1).

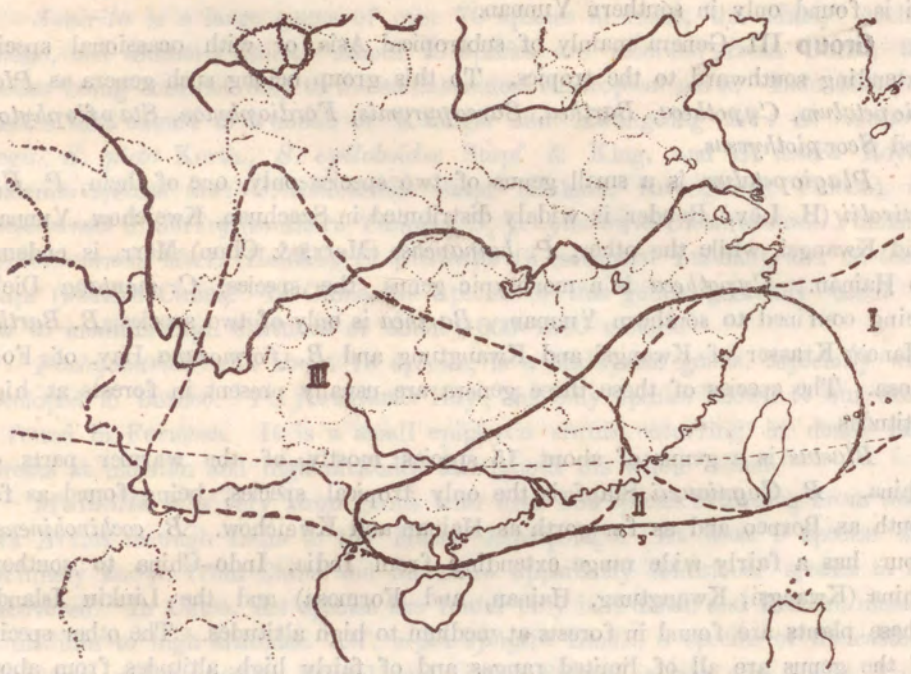

Fig. 1. Geographical distribution of the three sections of *Bredia:* I. *Eubredia*, II. *Tashiroea*, III. *Sinobredia*.

The section *Eubredia* comprises 3 species, *B. hirsuta* Blume of Formosa, the Liukius, and southern Japan, *B. scandens* Hay. of Formosa, and *B. amoena* Diels of Chekiang, Fukien, and Kwangtung. It is thus a section of the islands of eastern and the maritime provinces of southeastern China.

The section *Tashiroea* comprises some 5 species and with a somewhat range as the preceding. The species extend from the Liukiu Islands through similar Formosa to the maritime provinces of China: Chekiang, Fukien, Kwangtung, and Kwangsi. The distribution of the species is as follows:

B. Oldhami Hook. f. (Formosa).
B. quadrangularis Cogn. (Fukien, Kiangsi).
B. okinawansis (Matsum.) Li (Liukiu Islands).
B. yaeyamensis (Matsum.) Li (Liukiu Islands).
B. sinensis (Diels) Li (Chekiang, Fukien, Kwangtung, Kwangsi).

B. sessilifolia Li (Kwangsi).

Tashiroea, as a genus, was originally considered as containing three species, two in the Liukiu Islands and one in the coastal provinces of China: Chekiang, Fukien, Kwangtung, and Kwangsi. This has sometimes been cited as a case of discontinuous distribution, as no species is being found in Formosa, which lies in between the two areas mentioned (5). However, this is evidently incorrect. The Chinese species, now known as *B. sinensis* (Diels) Li and originally assigned to *Tashiroea* by Diels with some doubt, is identical with the later named *B. glabra* Merr. *Tashiroea* is to be included in the concept of *Bredia*, and the Formosan species *B. Oldhami* manifestly of the same alliance.

The section *Sinobredia* is entirely of the Chinese mainland. The species extend from Yunnan, Sikang, and Szechuan in the west to Kwangtung and Kwangsi in the southeast. They grow in thickets and forests, at low and medium altitudes. The distribution of the species is as follows:

B. velutina Diels (Yunnan).
B. sepalosa Diels (Kwangsi).
B. microphylla Li (Kwangei).
B. Fordii (Hance) Diels (Szechuan, Kweichow, Kwangtung, Kwangsi).
B. Cavaleriei (H. Lév.) Diels (Yunnan, Kweichow, Kwangtung).
B. tuberculata (Guillaum.) Diels (Yunnan, Kweichow, Kwangtung).
B. longiloba (Hand.-Maz.) Diels (Hunan, Kiangsi, Kwangtung).
B. yunnanensis (H. Lév.) Diels (Yunnan).
B. omeiensis Li (Szechuan).
B. cordata Li (Sikang, Szechuan).

Sarcopyramis is a small genus of about 4 species. One of them, *S. nepalensis* Wall. is widely distributed in southern Asia from the Malay Peninsula, northeastern India, and Burma to southern China. It is a variable plant and is of common occurrence in forests at high altitudes. *S. delicata* C. B. Robinson was formerly known from the Philippines, Formosa, and Hainan, occurring at relatively high altitudes. Now it is also known from continental China, in Sikang and Yunnan in the west to Kwangsi and Kwangtung in the east. In addition to these two species, another two are recently known to occur in China: *S. parviflora* Merr. from Kwangsi, and *S. crenata* Li from Yunnan.

Fordiophyton is a genus of about 7 species, distributed from Indo-China to southwestern and southern China. *F. Faberi* Stapf occurs in Sikang, Szechuan, Yunnan, and Kweichow. *F. strictum* Diels and *F. begoniifolium* Li are endemic to Yunnan, in the south and the west of the province respectively.

Other very local species are *F. gracile* Hand.-Maz. of Hunan, and *F. polystegium* Hand.-Maz. of Kwangsi. *F. Fordii* (Oliv.) Krasser is widely ditributed in Kweichow, Kwangtung, Kiangsi, Fukien, and Chekiang.

Stapfiophyton comprises only three species, all found in the southernmost part of China. All species are local in their ranges; *S. peperomiaefolium* (Oliv.) Li and *S. elattandrum* (Diels) Li are found in Kwangtung while *S. tetrandrum* (Diels) Li is found in southern Yunnan.

Scorpiothyrsus, a genus of about 5 species, is endemic to Hainan. The species, *S. xanthostictus* (Merr. & Chun) Li, *S. glabrifolius* Li, *S. oliogotrichus* Li, *S. xanthotrichus* (Merr. & Chun) Li. and *S. erythrotrichus* (Merr. & Chun) Li are all suffruticose herbs, found in dense woods and apparently of rare occurrences.

III. Discussions and Conclusions

The species of the Melastomataceae are herbs, subshrubs or shrubs, or some times small trees. Some of them are epiphytic. These plants usually associate with thickets or broad-leaved forests at low to high altitudes.

In the three groups discussed above, the first group contitutes distinctly tropical or Malayan elements. Of the three genera in this group, *Astronia*, *Anplectrum*, and *Pternandra*, each has only one of its species extending into our area. The last two genera have representatives only in Hainan, which is the southernmost large island of China. The first one has one species extending to the southern tip of Formosa, as well as in the small islands of Botel Tobago and Kasyoto, lying southeast of Formosa in the Pacific.

The flora of Hainan is essentially tropical in nature and its assosiation with that of Tokin of Indo-China is very close (8). The southern tip of Formosa has a similar climate. Floristically Formosa is closer to China to the Philippines, as pointed out by Merrill (9). The flora of Botel Tobago and Kasyoto which belong to Formosa politically and are closer to Philippines than the Formosa geographically, has a defintite affinity with the latter. Kanehira (4 5) has listed a number of Philippine plants that are found in Botel Tobago but not in Formosa proper.

The second group discussed above comprises also genera primarily of Indo-Malayan origin. However, these genera have wider ranges, and some of their species extend farther north than that of the first group. The ranges of some of their species, such as *Osbeckia chinenensis* L. and *Osbeckia crinita* Benth., may extend as far north as the Yangtze River in Sikang, Szechuan,

Hupeh, and Anhwei, but these are very common weedy plants that often inhabit waste lands. The majority of the species occur in Yunnan, Kweichow, Kwangsi, Kwangtung, Hainan, southern Hunan, southern Kiangsi, Fukien, and Formosa, especially toward the more southern and warmer Provinces.

The presence of these elements in eastern Asia is a relatively recent event. This is shown by the fact that they are usually associated with secondary forests. These Malayan types extended northward toward China during geological times when climatic and other conditions became tolerable. They reached Hainan and Formosa through Indo-China and southern China at a time when these islands were still parts of the Asiatic continent in the Pleistocene. We find that there are more Malayan elements in the western part of southern China than along the eastern coast, and that there are more in Hainan than in Formosa. These facts indicate somewhat the direction of invasion of these tropical types.

The third group mentioned above comprises of those genera that are mainly of China. While they are limited to the more northerly regions than those of the former two groups, nevertheless they still occupy mainly warmer regions of China including Hainan and Formosa. *Cypotheca* is endemic to southern Yunnan and *Scorpiothyrsus* to Hainan. *Barthea* is found in Kwangtung, Kwangsi and Formosa, and *Stapfiophyton* in Kwangtung and southern Yunnan. *Fordiophyton*, *Bredia*. and *Blastus* have larger number of species and wider ranges, but their northern limits do not pass beyond that of the former group. The majority of the species still concentrate in the southernmost warmer parts of China. The norternmost extensions of the majority of species of the three groups are summarized in Fig. 2.

The various genera discussed above clearly indicate that they are originated in southeastern Asia including the broad area of Malaysia, southern Asia, and southern China. Some of them probably originated in the south and then extended northward, such as *Osbeckia*, *Melastoma*, *Allomorphia*, *Sonerila*, *Medinilla*. and *Memecylon*, Others, like *Bredia*, *Blastus*, *Fordiophyton*, *Barthea*, etc. are apparently of more northern origin. Stapf (10) has suggested that these Sino-Malayan types probably sprang from the old continent in which China and Malaya joined together. There are many other groups of plants of similar origin.

Geographically, in southeastern Asia, there are no sharp physiographic barriers to separate distinct floras. The chief factors that delimit the extension of tropical Malayan types on the continent of Asia are apparently climatic. A study of the geographical distribution of the Melastomataceae shows that some

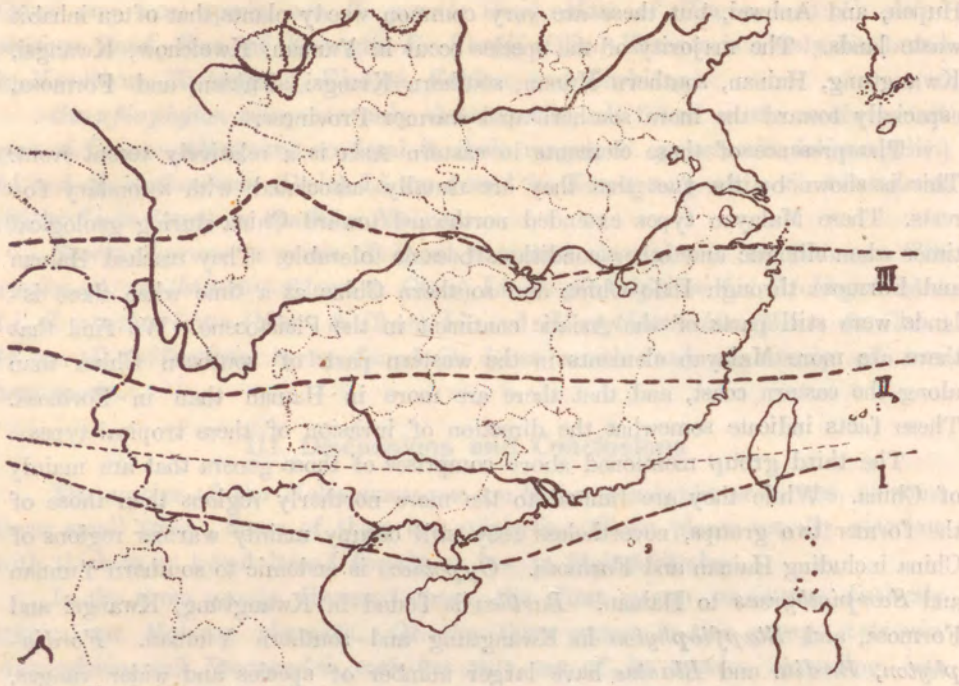

Fig. 2. The northern limits of the maority of species of the three groups (I, II, III) of Melastomataceae in China.

of the strictly tropical groups rarely extend farther north beyond southern Yunnan, Hainan, adjacent parts of Kwangtung and Kwangsi, and southern Formosa. Subtropical groups inhabit a more northern area extending from the southern parts of Szechuan in the west, through Hunan, Kiangsi and Fukien to Formosa in the east. The more adventive species may extend their ranges all way to the Yangtze River.

Although rough areas can be assigned to these strictly tropical and subtropical groups, sharp lines of demarcation are impossible to draw. The lack of distinct physiographic barriers accounts for this result. Instead of sharp lines, we may picture broad belts, controlled primarily by climatic factors and secondarily by physiographic, edaphic, and other factors, that the majority of the tropical and subtropical groups may occupy. The limit of these belts apparently varies with the different species, each of which has its own preference and tolerance of the environmental conditions. This situation will also explain the well known fact in plant geography that there is no agreed line of division of

the northern and southern floras in eastern Asia among the botanists (1). Geographic botanists, emphasizing on different groups of plants, naturally reach different conclusions. And it has been shown above that such a line actually does not exist.

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